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INDUSTRIAL POWER

WHITE PAPER

Natural Gas Generators and Healthcare

It is well known that hospitals and many other healthcare facilities must adhere to National Electric Code (NEC®) 700 and National Fire Protection Association (NFPA®) 110 standards, meaning emergency power must be available within 10 seconds to life safety and critical branch loads if a utility failure occurs. Over time, healthcare facilities often open new wings or they add new equipment to better serve patients and the existing generator may not offer enough support.

While diesel has been the traditional fuel choice, many healthcare facilities are now using natural gas generators upon approval of the authorities having jurisdiction (AHJs) to meet these runtime requirements during times of crisis. This paper will provide an overview of the benefits of natural gas fueled generators for hospitals and other healthcare facilities, highlighting Generac's market-leading technology.

Introduction

In the past, utility power to healthcare facilities has been dependable. Many times, when utility power is lost, it was for a short time. However, recent weather events and over-worked utility grids have caused long-term power outages. Diesel or natural gas generators both meet the backup power needs for these critical facilities, but some have been turning specifically to natural gas.

Natural gas generators are being specified for many healthcare facilities as the permitting requirements are easier. In addition, more AHJs are now considering the natural gas pipeline network to be an acceptable onsite fuel storage. Natural gas is also a cleaner burning fuel, no storage tanks are required and runtime is unlimited.

Fuel Reliability

When selecting or specifying either gaseous or diesel-fueled gensets, it is important to consider the reliability of the fuel infrastructure, regulatory issues and how local authorities perceive and regulate fuel choices. Reliability of fuel supply tends to be of great concern for AHJs. Typically, AHJs require the use of onsite fuel for facilities that are categorized as NFPA 110, Level 1 loads; these are defined as backup power systems installed “where failure of the equipment to perform could result in loss of human life or serious injuries.” NFPA 110 Level 1 loads are typically associated with NFPA 70: National Electrical Code (NEC), Article 700: Emergency Systems. Mission-critical applications like these, which include hospitals and 911 call centers, rely on diesel-fueled generators because onsite fuel storage is perceived to be more reliable.

While NEC requires an onsite fuel supply for mission-critical and legally required standby systems, it allows the AHJ to permit the use of other fuels in applications that have a low probability of a simultaneous failure of both the offsite fuel delivery system and the power from the outside electrical utility company. However, storing diesel fuel onsite is seen as increasing the reliability of backup power in non-code required applications, and makes it possible to provide backup power in remote areas that do not have access to a gaseous-fuel infrastructure.

Traditions are typically hard to break, which could explain why many AHJs continue to require diesel-fueled gensets. Diesel has been the traditional fuel of choice for backup and standby gensets. Historically, the use of diesel as a fuel for gensets has been a long-standing, proven technology. Because of this, the perception within the market is that diesel engines are the most reliable prime movers for backup power applications

While weather, human-caused disasters, and even labor issues such as strikes can impact diesel fuel delivery and availability, the natural gas utility infrastructure is generally very reliable.

Typically, factors that tend to impact the electrical infrastructure do not impact the natural gas infrastructure. In most cases, natural gas is delivered by underground pipelines that are usually not affected by severe weather that can cause electrical power outages.

Paralleling

Generac’s innovative Modular Power System (MPS) can provide the needed large kWs for hospitals along with the benefits of redundancy, scalability, and safety, through integrated paralleling. Integrated, on-generator paralleling solutions have been available for more than a decade, however, some users are not aware of the many benefits these types of systems offer compared to traditional parallel solutions.

- *Cost*: Historically, paralleled power generation was accomplished through utilizing third party vendors that integrated UL891 dead front panel boards into generator paralleling switchgear. Though effective, the cost of this approach is the most notable drawback. The capital cost for low voltage traditional generator switchgear is typically $25,000 to $30,000 per section. To parallel two generators, which typically requires a multiple section configuration, would cost $50,000 to $75,000. That is just the start of the entire project’s expense. Installation and commissioning of the system also add significantly to the cost of most traditional switchgear configurations.

- *Space*: In a traditional system, switchgear needs dedicated floor space inside the building. Plan for each section to be 36” wide by 48” deep and 90” tall. Also, plan for a minimum of 3 feet of space in front and 3 feet of space behind the switchgear cabinets. The switchgear lineup needs to be physically located in place which may require on-site assembly and bus work reconnection.

- *Integration and Startup Issues*: With traditional systems, many different manufacturers are involved in the process including the genset manufacturer and the switchgear manufacturer. Should something go wrong, it can difficult to determine which system or OEM is at fault. In addition, owners should plan on a week for the entire installation process as connecting all these different pieces together takes time. Once installed, it often takes another week or two for startup and commissioning. This process requires the generator and switchgear technicians to be on-site and startup rarely goes smoothly. The only exception to this is for equipment that has been previously tested at the factory as an entire system (generators and switchgear). It soon becomes obvious to anyone running the numbers that the traditional approach to paralleling generators can only be justified for a limited number of high-end applications.

Integrated parallel systems minimize the number of controls, providing an inherently more reliable system. They also integrate paralleling switchgear into the system, so a third party switchgear solution is not needed. In 2003, Generac introduced its innovative, integrated paralleling solution, MPS, which offers a single digital controller (G-panel) mounted on the generator to control all genset operations including paralleling. The G-panel is specifically designed to make configuring and commissioning a parallel generation solution as easy as a single genset. Generac's MPS solutions are typically commissioned by distributor technicians within 1 to 3 days versus the traditional market norm of factory technicians taking 1 to 3 weeks. MPS units include a generator mounted paralleling switch that allows the generators to automatically connect to a common generator bus without the need for external switching devices. With the on-generator integration of the paralleling switching, there is no need for expensive and complicated third party paralleling switchgear. The generators are simply cabled to a common electrical connection point such as a junction box, large transfer switch, or distribution panel. As acceptance of paralleled solutions continued to grow within the market, Generac extended MPS onto its larger 750 to 2000 kW generator line-up. The implementation is conceptually the same, but the hardware configuration was revised to align the various features with those needed as the generator and system capacity increases.

While it rarely happens, should a hospital's single large kW backup generator fail in an emergency, lives are at risk. With Generac's MPS, you have at least one other backup/emergency generator operating to ensure critical operations continue. This means the kW requirements of the smallest genset in the paralleled system is sized appropriately to meet those needs.

With our unique MPS, you can also combine generators using a variety of fuels such as diesel and natural gas. This not only gives you the benefits of genset redundancy, but now you have fuel redundancy as well. Generac's MPS approach does not require dedicated switchgear sections. Future expansion generators simply tie directly to the generator bus. As the paralleling is already built into our generators, the MPS system fundamentally has greater flexibility for growth, requires less electrical room space, and reduces initial capital cost.

Energy Management

Hospitals have a lot at stake, and if the power is unreliable, the lives of patients, staff members and visitors are at risk. Additionally, like all industrial consumers of gas and electric, hospitals want to take a more active approach in managing their energy spend. In recent years, concepts such as energy management, distributed energy, microgrids and nanogrids have revolutionized the power system industry. These concepts, along with several others, have changed the perception of the standby generator, as not only a way to provide the emergency backup to the facilities, but also to utilize their potential to reduce the running cost and generate revenue by maximizing the generator use.

We can define energy management as a systematic and organized managing of energy, in our case a natural gas generator or set of generators, is the most cost-effective way to increase the availability of power, achieve overall emission reduction, manage risk and increase efficiency. With the growing needs and increasing energy demand, concepts such as energy management are being utilized more on a daily basis. The emergency standby generators that are required by the National Electric Code (NEC) can and are used for beyond standby needs. Energy is considered to be one of the top five operating costs for many facilities and strategically managing the energy demand would directly affect the bottom-line cost and expenses. Effective energy management can help to manage the energy costs by utilizing the available means in a smarter way. By utilizing the onsite generator during the peak demand periods, it would lower the overall utility power use and it would result in avoiding high-energy charges from the utility company. In other words, the user who is utilizing their natural gas generator for beyond standby, non-emergency applications is getting an increased ROI on their generator. The use of a natural gas generator provides several benefits; firstly, natural gas is a cleaner fuel source when compared to other fossil fuels such as coal and diesel. The cleaner emission from a natural gas generator would result in less carbon discharge to the atmosphere, which contributes towards a cleaner environment. In a microgrid and distributed energy type application, a natural gas generator is a perfect solution for electric power production and storage. Combined heat and power (CHP) is also a beyond standby application that utilizes a natural gas generator, which provides several environmental, economic, and reliability benefits.

Numerous factors must be considered before utilizing a generator in beyond standby applications such as:

- *Emissions:* Generators used in a non-standby application have different emissions requirements that are set by the Environmental Protection Agency (EPA) and require a different emissions certification than a standby generator. Generac Industrial Power's natural gas generators are factory EPA certified to be used in a non-emergency application (demand response), meaning the end user does not have to apply for a generator emissions certification and they do not need any type of site testing to obtain an emissions certification.
- *Local Utility:* In order to enroll in an energy management program, the first step is to contact your local utility supply company to understand the details and any terms and conditions that a client may have to satisfy before they may enroll into an energy management program (demand response, peak shaving, etc.)

- *Controls and Hardware:* Depending on the type of energy management program, the end user may be required to meet specific levels of control and hardware requirements. The experts at Generac can facilitate this process and provide expertise in determining the hardware and controls needs that may be required for your application.
- *Generator Maintenance and Serviceability:* Maintenance and serviceability requirements for a generator used in a non-emergency application are very different from a standby generator. The standby generator operates for a limited number of hours as compared to the generator that is being used in a non-emergency application, which has longer run hours. Longer run hours require more frequent maintenance and serviceability.

Conclusion

Developments in technology will continue to make gaseous generators, like Generac's new 49L, 1000 kW natural gas generator, ideal solutions for healthcare facilities. Generac's 1000 kW natural gas generator provides longer run times so everything continues to operate effortlessly until power is resorted. All of our industrial gas generators are completely cost effective and give facilities the best value for the output so they can afford more of what is needed to provide better care. Also, as distributed generation grows, healthcare facilities will be a natural fit for leveraging gaseous generators to better manage electricity, heating and cooling costs as well as supplying critical backup power. The bottom line is that emergency power must be available 24/7, at any time the utility suffers a failure, and it must be available to life-supporting loads within 10 seconds for as long as the utility outage lasts.

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